

UNITED STATES ARMY WAR COLLEGE  
CIVILIAN RESEARCH PROJECT

**LONGITUDINAL TRACKING OF HEALTH RISKS ASSOCIATED WITH THE  
SOLDIER'S LIFECYCLE ASSIGNMENT**

By

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Arlington, Virginia 22202-4136

Report Documentation Page				Form Approved OMB No. 0704-0188	
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE <b>MAR 2004</b>		2. REPORT TYPE		3. DATES COVERED <b>00-00-2004 to 00-00-2004</b>	
4. TITLE AND SUBTITLE <b>Longitudinal Tracking of Health Risks Associated with the Soldier's Lifecycle Assignment</b>				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) <b>U.S. Army War College, Carlisle, PA, 17013</b>				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT <b>Approved for public release; distribution unlimited</b>					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT <b>One of three strategic goals on the US Army Medical Department (AMEDD) Balanced Score Card is ?to protect and sustain a healthy and medically protected force?. Outcomes that measure this objective are healthy soldiers protected from injury and disease throughout their assignment lifecycle. In the last decade many strides have been made to maximize health, fitness, and medical preparedness of forces being deployed, while minimizing disease and injury risks during deployments. Although, today we have a broader understanding that the successful execution of this strategy depends on the effective conduct of comprehensive military medical surveillance (CMMS), the Army has made considerable efforts in various areas and in response to the demand has responded with several medical and health surveillance initiatives. This research paper will provide an overview of Department of Defense (DOD), Army and AMEDD interim electronic outpatient records in place and their current application and will discuss the Longitudinal Health Risk Assessment Program (LHRAP) and provide recommendations. The LHRAP is a proposed evidence-based screening and risk reduction program designed to decrease morbidity and mortality associated with chronic health risks such as hypertension, hyperlipidemia, and smoking. The program addresses cardiovascular and cancer risks for active duty soldiers aged 35 and older.</b>					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT <b>Same as Report (SAR)</b>	18. NUMBER OF PAGES <b>32</b>	19a. NAME OF RESPONSIBLE PERSON
a. REPORT <b>unclassified</b>	b. ABSTRACT <b>unclassified</b>	c. THIS PAGE <b>unclassified</b>			

## ABSTRACT

AUTHOR: Lieutenant Colonel Judith Ruiz

TITLE: Longitudinal Tracking of Health Risks Associated with the Soldier's Lifecycle Assignment

FORMAT: Strategy Research Project

DATE: 19 March 2004      PAGES: 38      CLASSIFICATION: Unclassified

One of three strategic goals on the US Army Medical Department (AMEDD) Balanced Score Card is “to protect and sustain a healthy and medically protected force”. Outcomes that measure this objective are healthy soldiers protected from injury and disease throughout their assignment lifecycle.

In the last decade many strides have been made to maximize health, fitness, and medical preparedness of forces being deployed, while minimizing disease and injury risks during deployments. Although, today we have a broader understanding that the successful execution of this strategy depends on the effective conduct of comprehensive military medical surveillance (CMMS), the Army has made considerable efforts in various areas and in response to the demand has responded with several medical and health surveillance initiatives. This research paper will provide an overview of Department of Defense (DOD), Army and AMEDD interim electronic outpatient records in place and their current application and will discuss the Longitudinal Health Risk Assessment Program (LHRAP) and provide recommendations. The LHRAP is a proposed evidence-based screening and risk reduction program designed to decrease morbidity and mortality associated with chronic health risks such as hypertension, hyperlipidemia, and smoking. The program addresses cardiovascular and cancer risks for active duty soldiers aged 35 and older.

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## ACKNOWLEDGEMENTS

I wish to acknowledge the contributions of COL Eileen B. Malone, AN, Chief Information Management and Information Technology, Office of the Surgeon General (OTSG), U. S. Army Department who was as integral part in the development of this paper. Through countless discussions and her wise counsel, I selected a meaningful topic that will certainly benefit the US Army Medical and potentially the entire U.S. Army. Her expertise and relationships with professionals in the information technology arena enabled me to work with a solid team of experts in conducting my research. I am deeply appreciative of her supportive presence and mentorship throughout my fellowship and course of study. Most importantly, she is my hero. Her cooperation and encouragement has instilled in me the motivation and inspiration for continued service in the Army Nurse Corps.

I wish to thank my project advisors, Mr. John Fittipaldi, Senior Fellow, Army Environmental Policy Institute (AEPI) and Colonel Wayne Foxworth, US Army War College. I extend special thanks and gratitude to the staff of the AEPI for their support throughout my fellowship, especially to Michael Cain, Director, for his concern and involvement. He was instrumental in assuring a successful and rewarding fellowship experience.

I also wish to thank, Ms. Allen M. Justina, Health Systems Analyst, US Army Center for Health Promotion and Preventive Medicine (USACHPPM), MAJ Michael Bell, MC, Occupational and Environmental Medicine, USACHPPM, Ms. Jeanette Hammond-Allen, Health Risk Manager, Kimbrough Army Community Hospital, for their assistance with the Longitudinal Health Risk Assessment Program. Many thanks to LTC Kelly Wolgast, AN, OTSG, US Army, whose reading of earlier drafts and comments lent a scholarly air to this paper.

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## LONGITUDINAL TRACKING OF HEALTH RISKS ASSOCIATED WITH THE SOLDIER'S LIFECYCLE

We are an Army at War. The challenge of the global war on terrorism demands the highest level of leadership and soldier proficiency. We cannot be risk-adverse; however, our soldiers are our most valuable combat assets. Therefore, reducing preventable losses throughout our formations is fundamental to protecting our combat readiness.

—General Schoomaker

One of the three goals on the U.S. Army Medical Department (AMEDD) Balanced Score Card is “to protect and sustain a healthy and medically protected force.” Outcomes that measure this objective are healthy soldiers protected from injury and disease throughout their assignment lifecycle.

Injuries represent the leading cause of morbidity and mortality among military service members.<sup>1</sup> In 2003, the Army experienced the highest accident rate in the last decade. The current rate, if not abated, will exceed last year's loss.<sup>2</sup> Additionally, many individuals separate or retire from the US military services with some percentage of Veteran's Administration determined disability. Some of these disabilities represent potentially preventable morbidity. It is posited that this morbidity may be preventable by early recognition of the various health risks and by targeting programs that modify behavior, activity, and training methodologies at some point earlier in the military careers of these individuals. There is a body of evidence-based research that supports ways to prevent disease and injury, also called evidence-based. Additional research is needed to continue to identify associated health risks of military deployments, military occupations and general military service.

We learned from the Gulf War that without baseline and longitudinal health data it is very challenging to determine the nature of health changes in service members. The Institute of Medicine (IOM) has reported the importance of longitudinal studies to measure change in health status and improved risk communication. The IOM also emphasized the need for the maintenance of retrievable electronic records of baseline health status, exposures, and health events that occur during a service member's career.<sup>3</sup> It is thought that a longitudinal electronic medical record supported by a clinical data repository that is accessible and queriable enables more accurate assessments of the effectiveness of military health care and thereby potentially suggest new preventive and therapeutic treatment modalities. In addition, an integrated information system that provides each service member with a comprehensive computer-based medical record from accession to retirement that is transferable is an added value for other agencies with responsibility for veterans' health.<sup>4</sup>

Linda D. Koontz, testified before the Subcommittee on Oversight and Investigations, Committee on Veterans' Affairs, House of Representatives on actions of the Department of Veterans Affairs (VA) and the Department of Defense (DOD) to achieve the ability to exchange patient health care data and create an electronic record for veterans and active duty personnel. According to Koontz, VA and DOD have been pursuing ways to share data in their health information systems and create electronic records since 1998. Their actions followed the President's call in 1997 for the two agencies to start developing a "comprehensive, life-long medical record for each service member," and a directive requiring VA and DOD to develop a "computer-based patient record system that will accurately and efficiently exchange information." Currently, the VA and DOD have achieved a measure of success in sharing data, as evidenced by VA clinicians now having access to military health records for veterans through the Federal Health Information Exchange (FHIE), a one-way transfer of health information. On a monthly basis, electronic health data from separated (retired or discharged) service members contained in DOD's Military Health System Composite Health Care System (CHCS) are being transmitted to a VA FHIE repository, which VA clinicians access through the department's current health system, the Veterans Health Information Systems and Technology Architecture. As a result, VA clinicians now have more readily accessible DOD health data, and have noted the benefits of this current capability in improving health care delivery. However, a virtual medical record based on the two-way exchange of data between VA and DOD is far from being achieved.<sup>5</sup>

In order to maximize medical and environmental surveillance, we must have the capability of collecting information on all illnesses and injuries, medical care, immunizations, and exposures to potential health hazards throughout the lifecycle of the service member in garrison as well as during any deployment.<sup>6 7</sup> These databases have great potential value for routine medical and injury surveillance to identify trends and high-risk groups and to develop appropriate intervention and prevention strategies. This research project discusses such a surveillance program, the Longitudinal Health Risk Assessment Program (LHRAP). The LHRAP is an evidence-based screening and risk reduction program designed to decrease morbidity and mortality associated with chronic health risks such as hypertension, hyperlipidemia, and smoking. The program addresses cardiovascular and cancer risks for active duty soldiers aged 35 and older. Also, this paper provides an overview of the AMEDD's interim electronic outpatient medical records designed to collect information about force health risks; assess the properties of the programs; and make recommendations.

## MEDICAL READINESS FOR THE TRANSFORMING ARMY

As a Nation at War, the importance of military medicine cannot be overstated. The mission of the Military Health System (MHS)—to “provide health support for the full range of military deployments and to sustain the health of members of the Armed Forces, their families” is a commitment of military medicine.<sup>8 9</sup> The reorganization of the military towards smaller, more flexible, multifunctional and highly dispersed units will demand a warrior who is more healthy, fit and productive and thereby impacting military medicine. As each warrior represents a more significant portion of the assets of the organization, soldier health, fitness and productivity and the ability of the health care team to detect, prevent or minimize health problems assumes greater importance to military leaders.<sup>10</sup>

General Peter Schoomaker said, “First is The Soldier. Our soldiers are paramount. They will remain the centerpiece of our thinking, our systems, and our combat formations. We must always remember, “Humans are more important than hardware. We must remember that soldiers ARE the Army.”<sup>11</sup> We’re on the brink of a new era in terms of what soldiers are being asked to do. In the future warriors are likely to deploy to remote areas away from a medical treatment facility, more frequently than in the past and remain away for longer periods of time. Military medicine is in the business of creating a hyper-fit soldier that can resist disease, is not prone to injury, and is able to withstand the rigors of an unfamiliar and hazardous environment.<sup>12</sup> To be a war-efficient health care delivery system, we must be responsive to the needs of the warfighters.

In light of this, health care should be approached holistically. Military leaders in conjunction with health care professionals need to encourage service members to take responsibility for their health, addressing not only their physical but mental health needs and identifying alternatives to facilitate informed choices and behavior changes to achieve optimal health.<sup>13 14</sup> This effort requires approaches that create healthier environments, and promote individual attitudes and expectations toward health and knowledge of preventive measures. The intent is to have warriors of tomorrow who know their primary care provider, practice healthy lifestyles, and are active participants in health promotion initiatives and including nutritional counseling.<sup>15</sup>

To do so, the MHS has recognized the limitations of the present curative model to improving health status and has focused on the importance of minimizing chronic and preventable illnesses. As a result, population health improvement initiatives and policies have become an integral part of health care delivery within DOD. In spite of these gradual changes in DOD MHS policy, health promotion and disease prevention policies cannot be transformed into

a culture of population health improvement approaches without the support of those providing DOD MHS health care.<sup>16</sup> Therefore, as these programs are implemented it is essential that DOD health care providers understand the program framework and the goals. By understanding and acknowledging the benefits of implementing the program, health care providers are better postured to effect organizational and cultural change to facilitate the organization-wide implementation of population health initiatives.<sup>17</sup>

Critically important is the recognition and management of the continuum of health care from point of entry into the service, throughout the service members' career, and after separation or retirement. Also, there must be a seamless longitudinal medical record for each member to capture all care provided. This record should include medical data for each member reflecting health care status at the military entry processing station, basic training, advanced individual training, garrison, pre-deployment, deployment and redeployment, and all intervening cycles.<sup>18</sup>

VA and DOD, collectively, provided health care services to approximately 13 million veterans, military personnel, and dependents at a cost of about \$47 billion in fiscal year 2002. While in military status and later as veterans, many patients tend to be highly mobile and, consequently, can have multiple health records initiated at federal and nonfederal medical facilities, both in and outside of the United States. Thus, having readily accessible data on active duty personnel and veterans is important to facilitate providing quality health care to them.<sup>19</sup> The capturing of care across the health care continuum within VA and DOD, into a single electronic record reduces the fragmentation of care associated with the traditional delivery of patient care services and facilitates care coordination regardless of where the patient accesses this integrated system.

### FORCE HEALTH PROTECTION

Senior leader's mental and physical readiness directly affects the quality of decisions and is important factors for success or failure in information age warfare.

—General Dennis Reimer

The MHS has evolved in the last decade in response to concerns and unanswered questions about the health of veterans and associated deployment health issues. The DOD has applied many of the lessons learned since the Gulf War in the development and implementation of more effective policy and programs. These policies mandate health surveillance activities during all major deployments and deployments that pose a significant health risk to deployed personnel.<sup>20 21</sup> In spite of the fact that military preventive medicine is concerned with

operational readiness, and the basis of services rendered is treating illnesses or reducing risk that occur during deployment, minimizing chronic and preventable illnesses has become as important.<sup>22</sup> Today's U.S. military is interested in the overall health and wellness of the war fighter. In particular, research indicates that commanders are increasingly concerned with the role of health behaviors in military training and readiness.<sup>23</sup>

Today's force health protection (FHP) strategy encompasses the integrated preventive, clinical, and operational programs necessary to protect the health of the "total force." This is quite different from previous medical readiness planning, in that it places emphasis on staying healthy and fit and on the prevention of injury and illness, while maintaining an exceptional casualty management system.<sup>24</sup> A major goal of FHP is to make military members partners in protecting their health by supplying them with knowledge, skills, and resources needed to stay healthy during military service.<sup>25 26</sup>

### COMPREHENSIVE MILITARY MEDICAL SURVEILLANCE

The US Army Center for Health Promotion and Preventive Medicine (USACHPPM) as the DOD Executive Agent for comprehensive military medical surveillance (CMMS) has taken a lead role in the design and execution of the DOD CMMS. CMMS emphasizes the population-based approach in support of health specific groups of military personnel. CMMS is capable of providing timely information on a broad range of indicators of health populations of interest unique to DOD. These indicators include population factor, potentially hazardous exposures, use of protective measures and equipment, personal risk factors, health outcomes and clinical screening.<sup>27</sup>

### CURRENT AMEDD APPLICATION SYSTEMS

Many advances have been made to in the last decade to maximize health, fitness, and medical preparedness of forces being deployed, while minimizing disease and injury risks during deployments. Although, today we have a broader understanding that the successful execution of this strategy depends on the effective conduct of CMMS, the Army has made considerable efforts in various areas and in response to the demand has responded with several medical and health surveillance initiatives. Also, because of previous delays in the development of the next generation of Composite Health Care System II (CHCS II) a comprehensive electronic medical record, several healthcare facilities throughout the AMEDD have developed an interim electronic record built from a common platform, the Integrated Clinical Data Base (ICDB). These interim systems interface with the legacy system and provide capabilities in the areas of clinical practice guidelines management, population health care and

health of the soldier.<sup>28</sup> This section will provide an overview of current AMEDD interim electronic outpatient records and their use.

### MEDICAL PROTECTION SYSTEM

Medical Protection System (MEDPROS) is a module of the Army's Medical Operational Data System (MODS). It was initially created in 1998 for the purpose of tracking the administration of the anthrax vaccine immunization program. MEDPROS offers commanders a real time, world- wide operational system to manage the medical readiness and deployability of their unit. In addition, it provides commanders and functional staffs with comprehensive self-contained reports to assess the medical readiness of a unit or an individual soldier. MEDPROS tracks all the DOD individual medical readiness requirements. These include 20 established medical immunization profiles, HIV status, DNA specimen collection, dental readiness, date of last physical exam to include physical classification and other health status indicators.<sup>29</sup> MEDPROS elements to include HIV test date, DNA sample on file, Dental Status, Women's Health and Physical Exam feeds individual Army Knowledge On (AKO) line pages. Soldiers are informed of their medical readiness status each time they access AKO. Announcements are color-coded using a traffic light. A green light indicates that the Soldier is current on the requirement, amber means that it is expired and could affect your medical readiness and red indicates non-deployable. Ultimately, it is a commander's decision on whether to deploy or not, only pregnancy and a non-deployable profile stop someone from deploying. These announcements allow soldiers to be active participants in medical readiness and take responsibility for compliance adherence. In January 573,388 Army soldiers logged into the AKO Home page that displays the Soldier's medical readiness alert.

### HEALTHeFORCES

The HEALTHeFORCES initiative at Walter Reed Army Medical Center, Washington, D.C. is a disease management and health promotion program designed to improve communication and automation of military healthcare at the point of care. It currently supports five chronic health conditions and two preventive health services. HealtheSurveys are completed via a handheld device or web-based browser and responses are automatically incorporated into a computer generated Action Form. The provider accesses clinical practice guidelines and education materials using the HealtheCard and generates a treatment plan and referrals using the Action Form. The data is then documented on the HealtheNote. The HealtheNote is populated with other applications to ensure adequate documentation. In addition, the structure of the HealtheNote serves to prompt providers to document all elements of the visit.<sup>30</sup>

## THE ELECTRONIC PATIENT CARE ENVIRONMENT

Deployment Health and Readiness is the flagship of the Outcomes Program at Madigan Army Medical Center at Fort Lewis, Washington. The Electronic Patient Care Environment uses MedBase-ICDB to acquire and display information from legacy CHCS, and CIS, an Emergency Department data system, and handheld fielded medical recorders called the Battlefield Medical Information System Tactical (BMIS-T), using the Medical Communications for Combat Casualty Care (MC4) and BMIS-T software. The fusion of these capabilities enables electronic patient record keeping across Fort Lewis from inpatient stays, outpatient care and emergency department visits. All care is visible on one system. It automates and consolidates the entire clinical data access process, providing a mechanism for tracking the health of a patient. Most importantly, it extends from the medical center to all unit clinics and aid stations, and even further to support the new Health Care Specialist (91W) recording care provided in the field, to include deployed field training sites remote from Fort Lewis.<sup>31</sup>

## MEDBASE

MedBase was first developed at Fort Lewis, Washington and refined at Brooke Army Medical Center to address the need to monitor soldier healthcare outside of the medical centers from the field to the installation through profiling and client server technology. Medbase software is used to capture medical readiness data, to include pre- and post-deployment information and in-theater medical tracking, and for providing medical situational awareness to commanders. It automates and consolidates the entire medical readiness process and provides a mechanism for tracking the health of a soldier both in garrison and field environment.<sup>32</sup> It feeds MEDPROS and the Defense Eligibility Enrollment Reporting System (DEERS) for immunizations, and the Defense Medical Surveillance System (DMSS) for pre-post deployment health assessments.

## ARMY HEALTH ASSESSMENT PROGRAMS

Army senior leaders have recognized the importance of mental and physical readiness of our strategic leaders. A former Commandant of the United States Army War College (USAWC) indicated, "Commanders...will have to be mentally and physically tougher than their predecessors".<sup>33</sup> To best prepare our senior leaders for the rigors of asymmetric warfare, we must develop programs responsive to ensuring their mental and physical health. Several programs have been established or are underway to improve health status as well as to collect data on the health status of the military population. These programs provide the foundation and

are building blocks for the longitudinal tracking of health risks associated with the soldier's lifecycle assignment.

#### ARMY PHYSICAL FITNESS RESEARCH INSTITUTE PROGRAM

The primary mission of the Army Physical Fitness Research Institute (APFRI), located at the USAWC, Carlisle Barracks, Pennsylvania, is to conduct original Army research in the over-40 population. The AFRI assesses the baseline health and fitness of senior military officers and prepares these senior leaders to assume individual responsibility for optimal health and fitness. APFRI has provided health screenings, assessments, case management, and fitness programs to all incoming USAWC students. In 2001, the model used by APFRI was being advocated for use in other leadership schools such as the Command Sergeants Major Academy, Fort Bliss, Texas.<sup>34</sup> However, realignment of APFRI within US Army Medical Command created an opportunity to expand APFRI's mission to offer a comprehensive health and wellness program to larger number of senior Army leaders. Current guidance from, the Army Surgeon General is "If APFRI is right for AWC...ought to be right for others of same population (all COLs, SGM, etc)." AFRIs' model provided USACHPPM with a platform that was modified to develop a systematic health care campaign plan for all soldiers' 35 years and over.<sup>35</sup>

#### LONGITUDINAL HEALTH RISK ASSESSMENT PROGRAM

CHPPM is targeting the longitudinal assessment of preventable disease through the Longitudinal Health Risk Assessment Program (LHRAP). The LHRAP is an evidence-based screening and risk reduction program designed to decrease morbidity and mortality associated with chronic health risks such as hypertension, hyperlipidemia, and smoking. The program addresses cardiovascular and cancer risks for active duty soldiers aged 35 and older. Data from the Mortality Surveillance Division, Armed Forces Institute of Pathology that considered the nature of cardiovascular disease versus age was used to determine the cut off age at age 35 rather than at age 40. The data shows that a crossover to ischemic death can occur below the age of 40. Age 35-39 contributes 19% of total cardiovascular deaths and 13% of ischemic deaths. LHRAP uses algorithms to assign risk classifications based on data gathered during required patient physicals using the newly developed electronic history and physical forms. Intervention and follow-up is automatically prompted based on risk using nationally recognized clinical practice guidelines.<sup>36</sup>



## LONGITUDINAL HEALTH RISK MANAGEMENT MODEL

Figure 1 represents the 4-step model advocated within the proposed approach to managing patient care within the LHRAP. The program's core is its assessment of health status and risk factors for cardiovascular disease (CV) and cancer. During Step 1, a physical exam is administered and each individual is surveyed using a health risk appraisal that identifies behaviors, medical and family histories, health habits, life experiences, and clinical and fitness measures to determine wellness.<sup>37</sup> The health risk appraisal established a baseline for comparisons during future assessments. Using a systematic evidence-based approach, individuals are then classified into 3 risk categories (low, intermediate and high risk). This risk classification is used to guide and inform prevention activities as part of step 2.

The next component identifies follow-up intervention programs for each individual. From the surveys and risk classification, care plans, treatment needs and programs are tailored to the individual. Referrals are made to health care providers and individuals with an underlying health risk condition are scheduled for health care intervention programs for risk factor modification based on identified needs. This begins with the Wellness Center during step 3.

Tracking individuals and measuring their progress through the program step 4; whether it is sending reminder e-mails to complete a survey or a telephone call reminder for a visit to the physician, is what differentiates population health management from individual care.<sup>38</sup> Health risk managers must have quick and easy access to real-time data for data integration from the LHRAP and to provide valuable feedback to individuals on an ongoing basis, whether it is to encourage individuals to change or reinforce their behavior.<sup>39</sup>

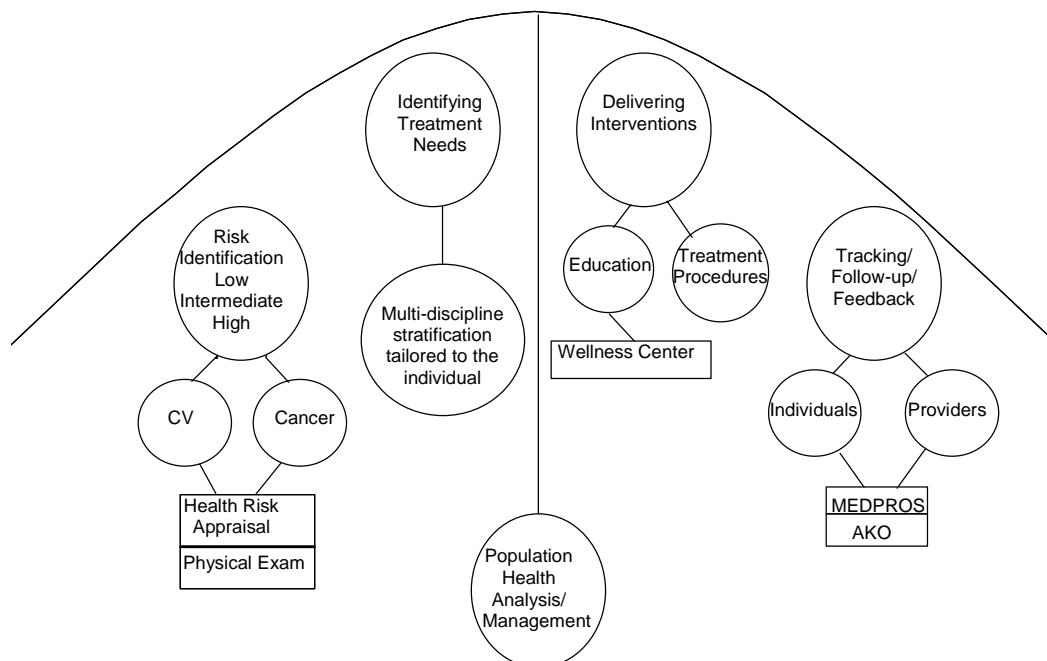


FIGURE 1 LONGITUDINAL HEALTH RISK MANAGEMENT MODEL<sup>40</sup>

## CORE MODEL COMPONENTS

Table 1 represents the components of the original AFRI model and depicts the modifications the LHRAP model. CHPPM has eliminated the Exercise Stress Test and Electron Beam Computed Tomography (EBCT). This modification stems from a large number of reported false positive results that caused unnecessary treatment interventions. The x in the yes column indicates that the parameter will be included in the LHRAP. The LHRAP captures the major risk factors for coronary heart disease (CHD) identified by the Framingham Heart Study and other studies.

APFRI Program Component	Yes	No	MODIFICATION
Exercise Stress Test		X	(DEL)
EBCT		X	(DEL)
Lipid Panel	x		(INCL)
Blood Pressure	x		(INCL)
Obesity Measure	x		(INCL)
Framingham Risk Appraisal	x		(MOD)
Health Risk Appraisal	x		(INCL)
Blood Glucose	x		(MOD) Based on Metabolic Risk
C-Reactive Protein*	x		(MOD) Intermediate/High Risk
PSA	X		(MOD) High Risk at Age 40; All Others Age 50
PAP Smear	X		(INCL)
Mammogram	x		(INCL)
Fecal Occult Blood Test	X		(MOD) High Risk at Age 40; All Others Age 50
Flexible Sigmoidoscopy/Colonoscopy	x		(MOD) High Risk at Age 40; All Others Age 50
Education	x		(INCL)
Aggressive Case Follow-Up	x		(INCL)

\* Not Currently an APFI Program Component

### Legend

Included in AFRI protocol and/or AR 40-501. Component does not require modification (INCL)

Component requires modification of either the APFRI protocol or AR 40-501. (MOD)

Delete component from APFRI Protocol and or AR 40-501. (DEL)

TABLE 1 RECOMMENDED PROGRAM COMPONENTS<sup>41</sup>

These risk factors include: age, gender, elevated serum total cholesterol and low-density lipoprotein cholesterol, low serum high density lipoprotein cholesterol, smoking status, blood pressure and whether or not you are on medication for high blood pressure. Lipoproteins are the form in which lipids are transported in the blood, which are combinations of lipids (fats) and proteins.<sup>42</sup> Other CV variables include, C-Reactive protein (a plasma that rises with inflammation), blood glucose (a simple sugar found in the blood) and body mass index (calculated from height and weight). Cancer variables are obtained from results of diagnostic procedures or screening tests based on age and gender for cervical cancer, breast cancer and prostate cancer.

In addition to the parameters described above, self-reported risk factors that captures detailed background and lifestyle data will be obtained electronically. Some examples are alcohol and tobacco use, family history, diet, exercise and occupational history. The data collected through the HealthSurveys supports the completion of the DOD (DD) Form 2808, Report of Medical Examination and DD Form 2807-1, Report of Medical History. The DD Forms are populated with data from other applications to insure that all of the data collected and reviewed by the provider at the time of the encounter is documented. The template components are designed based on medical record documentation guidelines, and approved algorithms based on national clinical practice guidelines. The structure of the clinical note serves to prompt providers to document all elements of the encounter in order to maximize the benefit to the patient through comprehensive care and a systematic approach.

### PILOT PROJECT

The LHRAP will be fielded at Ft Meade with a future plan to replicate the program at two other Army installations. The risk assessment for coronary disease will be the first parameter pilot tested to demonstrate success in risk reduction. There will be two program processes (Figure 2), one for individuals who are overdue for their physical exam and another for individuals who's physical exam is current. The program will be executed in two phases. During Phase I, the DD Form 2808, Report of Medical Examination will not be available electronically, and the physician will manually complete the report. The health risk manager will manually calculate and enter the risk categories once information is obtained from the soldier regarding prevalence of chronic diseases, disease risk factors, prevalence of preventive measures, and health care utilization.<sup>43</sup> The method for collecting self-reported information is being reviewed. Some options are adding a series of questions to the DD Form 2808, using a survey instrument "How's your health?" or the Health Enrollment Assessment Review 3.0.

When Phase II is implemented, DD Form 2808, Report of Medical Examination and DD Form 2807, Report of Medical History, will be available on line and the risk factors will automatically be calculated based on the electronic survey completed by the soldier on line. The DD Forms and surveys completed on paper during Phase I will be subsequently entered electronically.

The LHRAP will be jointly executed by the Physical Exam Section and Primary Care teams at the military treatment facility. Each soldier has a Primary Care manager who is responsible for coordinating the soldiers care and making appropriate referrals. Support personnel are responsible for patient flow, initial screening and patient preparation. The Longitudinal Health Risk Manager will track, follow-up, assist in risk stratification, analyze data and serves as the link to preventive service.<sup>44</sup>

Studies have indicated that the one of the most common barriers to the delivery of preventive services is the lack of time during the official visit. The number of recommended preventive services are increasing as new tests are developed and research demonstrates the value of preventive care for chronic diseases.<sup>45</sup> In light of the time pressure faced by PCM to see patients for acute visits and periodic preventive health evaluations, the electronic medical record provides readily accessible data.

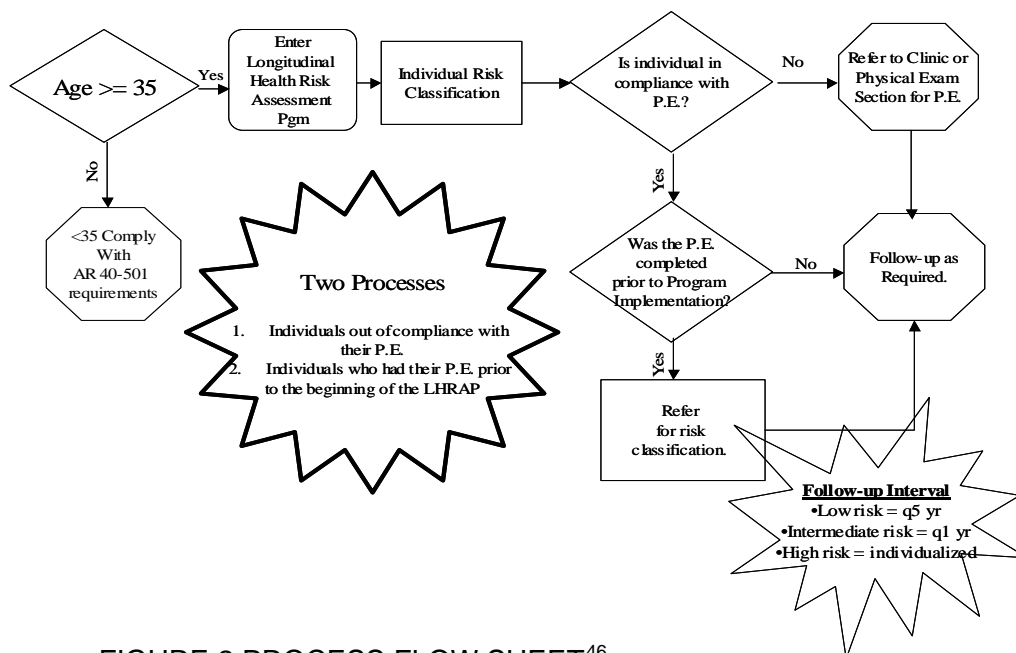


FIGURE 2 PROCESS FLOW SHEET<sup>46</sup>

Most of the information on the DD Forms will be pulled electronically from survey responses, or other applications. The automatic flagging and the pop windows for embedded protocols may save the PCM time, decreasing significantly the multiple keystrokes required to

access fields of interest and help identify those high-risk patients that require immediate attention and intervention. At this time injury risk reduction is not part of the LHRAP although, the impact of injuries on the U.S. Armed Forces is dramatic, resulting in death, disability, hospitalizations, lost duty time, and reduced military readiness. The lack of a reliable method within the Army to collect information on common musculoskeletal injuries has made it difficult to define the problem and design specific interventions. Both primary and secondary prevention is dependent on identifying those at risk and risk factor modification.<sup>47</sup>

### DOD PROGRAMS

Following the Persian Gulf War DOD conducted comprehensive public health surveillance with specific initiatives. This section discusses some of these programs and their roles.

#### RECRUITMENT ASSESSMENT PROGRAM

Pilot testing has begun on the Recruitment Assessment Program (RAP), a proposed DOD program for the routine collection of demographic, medical, psychosocial, occupational, and health risk factors from all U.S. military personnel at the time of accession. The RAP is administered during the first two weeks of training and currently uses an optically scannable paper questionnaire that will be entered into a centralized computer database on a continual basis. The working RAP questionnaire is being pilot tested to determine whether the data can be collected efficiently and entered into a database. The scanning software and computer hardware requirements are also being evaluated.

The RAP information will be the beginning of a longitudinal database that will be maintained as the first part of a soldiers' computerized health record. The baseline data will be accessible by DOD and the Department of Veterans Affairs (VA). The RAP could provide several important functions within DOD and VA health care systems. Baseline data could aid health promotion programs, while risk data could help providers identify factors that may benefit from preventive health interventions. In addition, the RAP would be the first building block of the military and VA electronic medical record. Baseline health data are needed by DOD and VA to provide documentation of previous health status when determining service-connected disability and will further ensure the optimal use of surveillance data collected during deployments. It can also assist in monitoring trends in health behavior and in the development of population-based preventive health measures and will be able to facilitate research that addresses fundamental health questions.<sup>48</sup> Although the RAP creates the foundation for an enormous longitudinal database, which can be linked to other DOD and VA systems, there is no mechanism to update this information throughout the soldiers' lifecycle. Therefore, follow-up

and linkages must be established so that the data could provide the health information required for longitudinal tracking of health risks over time.<sup>49</sup>

### DEFENSE MEDICAL SURVEILLANCE SYSTEM

The DMSS is the central repository of medical surveillance data for the U.S. Armed Forces. The DMSS integrates data from sources worldwide in a continuously expanding relational database that documents current and historical data related to medical events. These include hospitalization, outpatient visit, reportable diseases, HIV results, and health risk appraisals. It also includes personal characteristics, such as rank, military occupation, demographic factors and military experiences (e.g., deployment, assignments) of all service members throughout their careers.<sup>50 51</sup> The linkages of data relevant to individual characteristics, exposure states, medical events and specimens provide powerful seroepidemiological capabilities and unprecedented capabilities for conducting comprehensive population based surveillance. The system contains more than 250 million records on 7.4 million service members who served on active duty since 1990. The effectiveness of this system has been further improved in current operations through better input. Pre-and post-deployment health surveys are more comprehensive and now include face-to-face encounters with a health care provider.<sup>52</sup>

### DEFENSE OCCUPATIONAL AND ENVIRONMENTAL HEALTH READINESS SYSTEM

The Defense Occupational and Environmental Health Readiness System (DOEHRS) will be the Defense Department's multi-service occupational exposure database information system for all three military departments. DOEHRS will integrate industrial hygiene and environmental surveillance information for Military Health System occupational health staff and command surgeons, and will provide operational commanders with options for reducing health threats. The system will capture data for transfer to the computerized patient record standardizing the process throughout the services. DOEHRS will provide individual longitudinal exposure records for all DOD personnel, both military and civilian.<sup>53 54</sup> DOEHRS is a component of the Theater Medical Information Program (TMIP), an integrated medical information system that provide automated information management in deployed environments and will support risk identification for environmental and occupational hazards among deployed civilian and military personnel. When in place, DOEHRS will link a significant amount of valuable information. It will interface with the CHCS II, and the longitudinal electronic soldier's record.<sup>55</sup>

Presently, the Occupational and Environmental Health (OEH) Data Portal is an interim solution for until the full deployment of TMIP and DOEHRS.<sup>56</sup> The OEH Data Portal focuses

primarily on deployed service members. However, the garrison element, predominantly for the occupational health is important to the deployed setting as well. Once all of this data is integrated into DOEHRS, military leaders will have an automated system to support data collection storage and analysis needed for tactical decisions. Also, health professionals will receive the medical surveillance related data that can reduce future health risks to the force. However, to collect the initial data for all of the initial work sites is projected to take three to five years.<sup>57</sup>

### RECOMMENDATIONS

The military health system can no longer just deliver disease focused medical care and care for battlefield casualties. The perceptions and expectations of military families, veterans, and the nation at large have changed. Military members must be protected by actions that are guided by current medical knowledge and practice guidelines. A strategic plan that integrates population health concepts and approaches into the military health care system can help us to better understand the causes and prevention of unexplained chronic illnesses in the general population. Moreover, we could begin to understand the health impact of service in a combat or deployed environment.<sup>58 59</sup> Proposed applications such as the RAP and the LHRAP, that aggregate the health status data are important to establishing programs that target patients at risk for developing chronic diseases and would assist in monitoring trends in the development of population-based preventive health measures.<sup>60</sup> However, the impact of these strategies as effective mechanisms for improving the health status of our soldiers and for combating problems with quality, and cost must be articulated and tested.<sup>61</sup> DOD should further evaluate a comprehensive health care population management model in the military that integrates health data periodically as part of a longitudinal health record. Effectively integrating and coordinating patient care across the continuum is essential to improving patient care, maintaining readiness and reducing cost.<sup>62</sup>

The electronic communication and information technology applications, especially the computer based patient record is critical to gain the greatest efficiency. In fact, on January 20, 2004, President George W. Bush said before a joint session of the Congress during his State of the Union, address “by computerizing health records, we can avoid dangerous medical mistakes, reduce costs, and improve care.”<sup>63</sup> Although many advances in information and technology are forthcoming, and will soon be within our reach, they must be linked to a business process and a well-developed management plan. The business process must describe each activity step by step and should include requirements, resources and deliverables. The program

must be managed and administered by a strong interdisciplinary team of physicians, nurses, and other qualified professionals who work in concert to facilitate the assurance of medically appropriate quality patient care. Implementation of policy that provides the framework and guidelines to effect to organizational culture and change as well as ongoing participation by the healthcare organization staff and the individual supported with up-to-date information and willing staff participation, can be the determining factor of a successful program.

In the last ten years, there have been major strides in the prevention of coronary heart disease through the modification of its causes. In addition, aggressive medical therapy has demonstrated to substantially reduce the likelihood of recurrent major coronary syndrome in-patients with CHD. Identifying evidenced-based risk factors for disease and injury to prevent progression in our population is critical. The prevention of disease through modification of its causes, appropriate interventions and risk-reduction efforts based on those risks has the potential to bring about a significant risk reduction, prevent chronic disease and injury to military service members and can help save lives today.

Lastly, the LHRAP must be studied rigorously so that we can really know its' effect on the health of service member's 35 and over and close the gap in care that leads to poor outcomes in our health care system. This is critical in that outcomes alone are not enough to evaluate the program, but rather to what extent did the LHRAP intervention cause that improvement. The cause-effect of the LHRAP must be articulated and tested to assess the effectiveness of the LHRAP. A credible evaluation that compares the metrics observed in the LHRAP population with metrics that would have been expected in the absence of the LHRAP could be fulfilled by using a pre-intervention tool/post intervention design without a control group that receives no intervention. This method is the most practical, considering that the LHRAP is truly part of our core business and operations and not part of a research effort where a more rigorous design that uses randomization or control groups as a method of assessing results would be indicated.<sup>64</sup>

## CONCLUSION

We must make every effort to improve the health of our service members and reduce the prevalence of morbidity and mortality associated with chronic disease, injury and disability amongst US military service members. The implementation of a health promotion/risk reduction program could potentially deliver care that contributes to better outcomes and maintain optimal member health status throughout the soldier's lifecycle assignment. Once the clinical and



financial effects of the LHRAP are known, the program could potentially be applied to other branches of the military and to the entire population.

A well-designed health promotion program with real time information and reporting capabilities relies heavily on electronic communication and information technology applications especially the life-long fully integrated computer-based medical record. Until CHCS is full deployed in 2008, today's technology and data availability is dependent on many interim efforts underway for automated longitudinal tracking of health risks associated with the soldier's lifecycle assignment. The focus of the AMEDD should be on integrating current information technology products that have been found to be valuable in their interim efforts. These systems have many capabilities and benefits that vary considerably but are valuable in that each one provides a building block to population health and achieving the enterprise-wide longitudinal electronic medical record for service members.

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